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is from B₅ to G₅. For the fainter stars no spectral types have been determined, but the color indices indicate a further progress in spectral type to K₅ or M for the stars of 14th to 15th magnitude. The color indices of the classes Fo to G₅ are systematically smaller than those corresponding to these spectral classes on the average, a fact which seems to be a general characteristic of dwarf stars.

The luminosity law, established for the central part of the *Pleiades* over a range of 11 magnitudes, does not resemble a smooth error curve, but has a well defined minimum at 9th magnitude. As a consequence of the relation between magnitude and spectral type the luminosity law simply reflects the frequency law of spectral types. Just as for the whole sky on the average, the classes A₅ to F₅ are the least numerous among the *Pleiades* members, and therefore the luminosity law, too, has to show a minimum for the corresponding magnitudes. This minimum divides the *Pleiades* members into two classes: The stars of Secchi's first type, (B₅–F₅) of high luminosity, about 80 in number for the whole cluster; the stars of Secchi's second and third type (F₅–M), of small luminosity, for which the list is incomplete, but which must be at least three to five times as numerous.

A parallax value of 0".008 for the *Pleiades* was obtained from a comparison of the luminosities and spectral types of its members with corresponding data for the dwarf stars of known parallax. The orbital motions of ten double stars physically connected with the *Pleiades* give a hypothetical parallax of 0".010. The round parallax value of 0".010 should at present be the most reliable information on the distance of the *Pleiades*.

ROBERT TRUMPLER.

NOTE ON THE SPECTRA OF THE COMPANION TO POLARIS AND THE DOUBLE STAR Σ 2245

From spectrograms lately obtained with the 36-inch refractor and light 1-prism spectrograph of the Lick Observatory, the spectral class of the companion to *Polaris* ($= \Sigma$ 93, 2^m.1 and 8^m.8, p. a. = 216°, dist. = 18".2) has been determined as Fo. That of the principal star is F8. From Adams's spectroscopic parallax of *Polaris*, 0".010¹, its absolute magnitude and that of the companion are, on the assumption that the two stars are physically connected and therefore at the same distance, respectively – 2.9 and +3.8.

¹*Mt. Wilson Contrib.*, No. 199, 25, 1921.

Hence, according to this parallax, the brighter star is a "super-giant" and the fainter one a dwarf, the spectral class of the latter being what would normally be expected for the secondary component in a double star with the foregoing absolute magnitudes and primary of class F8. The trigonometric parallaxes yield much lower values for the absolute magnitudes; *e. g.*, from Kapteyn's composite parallax of $0''.047^2$, they are respectively $+0.5$ and $+7.2$, and from Dr. A. E. Glancy's determination of $0''.086^3$, $+1.8$ and $+8.5$. Both of these parallaxes would indicate that the companion is an unusually faint star for its spectral class, but it is likely, especially in view of the relation prevailing between the spectral classes of the components, that their absolute magnitudes, as derived from the spectroscopic parallax, are the most reliable.

In the vast majority of double-star systems so far investigated, where the components are of equal magnitude, they are found to be almost identical in spectral class. A striking exception, however, which has recently been observed here, is $\Sigma 2245$ ($= \beta$. *G. C.* 8243, 1900 $\alpha = 17^h 52^m.1$, $\delta = +18^\circ 21'$, *p. a.* $= 112^\circ$, *dist.* $= 2''.5$). Both components of this pair are of the same visual magnitude (7.3), but the *preceding* one is of class G5, whereas the *following* is of class B9. This double therefore belongs in the same group of rare stars as γ *Circini*, of which the components, of magnitudes 5.2 and 5.3 and $1''.2$ asunder, have, from the composite character of their combined spectrum, been classified at Harvard⁴ as respectively of classes G and B5. Altho the value of the parallax of $\Sigma 2245$ is not known to me at the date of writing, it seems probable, from the peculiar relation existing between the spectra of its components, that the star is a giant.

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BURNHAM'S GENERAL CATALOGUE OF DOUBLE STARS AND ITS EXTENSION*

(Abstract)

A practically complete record of the history up to 1906 of every known double star within 121° of the north pole of the sky is contained in Burnham's *General Catalogue of Double Stars*. Progress in

²*Gronigen Publ.*, No. 24, 18, 1910.

³*Astron. Jour.*, **31**, 70, 1918.

⁴*Annals, H. C. O.*, **56**, 240, 1912.